Pearson Edexcel

Examiners' Report

Principal Examiner Feedback

Summer 2025

Pearson Edexcel International GCSE

In Mathematics A (4MA1) Paper 1HR

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Summer 2025
Publications Code 4MA1_1HR_2506_ER

IGCSE Mathematics 4MA1 1HR Principal Examiner's Report

Overall the questions on the paper were well attempted. Some of the later questions, assessing the higher grades, were left blank at times. However, many candidates did make an attempt and some were able to pick up marks from their working.

Working was generally well presented on questions that candidates were more familiar with and there were clear attempts to meet the command of "show that" or the instruction to "show clear algebraic working". On more challenging questions some of the working was disorganised in places, with no clear start or end point and working was not organised in a logical way. Candidates should try to apply the same organisation and structure to all questions.

It was clear that a good number of candidates had strong algebraic skills. This was evident on solving an inequality (Q6b), solving equations with algebraic fractions (Q15a) and solving a linear and quadratic simultaneous equation (Q22). It was noticeable that the algebraic proof question (Q17) was far more challenging, this was one question where clear algebraic working was far less evident.

Noticeably candidates were less familiar with set notation than expected (Q5b) and had difficulty converting the units of measurement for a speed (Q7).

Problem solving questions earlier in the paper were attempted well with a good number of responses gaining full marks.

Comments on individual questions

Question 1

This familiar topic of finding the LCM provided many candidates with a comfortable start to the paper. A range of methods to find the LCM were seen, including listing multiples, drawing factor trees or dividing both values by the HCF. Listing multiples invariably led to two marks being awarded. Those candidates who opted for factor trees often gave the HCF as their answer or gave an answer of $2 \times 3^2 \times 5^2 \times 7$ or 3150. The method of dividing both values by the HCF resulted in sight of the values 5, 9 and 14 which gained at least one mark, again a final answer of 5 was often seen from this method. Answers could be given in any equivalent form, answers of $2 \times 3^2 \times 5 \times 7$ or $5 \times 9 \times 14$ were awarded full marks if seen.

Question 2

Candidates seemed familiar with the concept of finding upper and lower bounds of a rounded value and correct answers were seen in the majority of responses. Occasionally an answer of 142.84 or 142.849 was seen for the upper bound which can not be credited. The weaker responses gave answers such as 142 or 143, giving the integer value either side, or 142.3 and 143.3 which was a result of adding and subtracting 0.5 to the rounded value rather than adding and subtracting 0.05.

Question 3

It was pleasing to see a large number of well organised responses that met all of the requirements of this "show that" question for multiplying mixed numbers. The first mark was awarded for correct conversions to improper fractions and candidates did this accurately. If they did not progress to full marks it was because important stages of the method were missed out. Jumping straight from $\frac{9}{4}\times\frac{12}{7}$ to $\frac{27}{7}$ without showing the cancelling first or writing the un-simplified product $\frac{108}{28}$ limited responses to one mark only. Equally stating that $\frac{108}{28}=3\frac{6}{7}$ without showing the simplification meant the final mark could not be awarded. Candidates must remember to show all stages of working and not rely on using their calculators to help with their solutions as this will bypass the required steps.

Question 4

This problem solving, probability question was answered well with a good numbers of responses being awarded full marks. In part (a) there were a very few responses that did not take account of the biased nature of the spinner and thus gave an answer of $\frac{3}{5}$ which treated each colour as having the same probability. In part (b) a few responses stopped short of the final answer and found either the probability of red as 0.24 or found the expected number of times the spinner would land on yellow rather than red. Final answers given as $\frac{84}{350}$ were awarded the three method marks only. Candidates were allowed to follow through their answer to part (a) if this was incorrect, pleasingly these responses were often able to be awarded all three method marks as clear working was seen.

Question 5

This question did highlight that a number of candidates were not overly familiar with some of the set notation symbols. In part (a)(i) the main confusion was between the required $A \cup B$ and $A \cap B$, in some responses the candidate had attempted to list all of the members of set *A* and all of the members of set *B*, hence doubling up on elements and not gaining the mark. Answers to (a)(ii) tended to either miss out one value or include one value from set *B*, demonstrating a lack of organisation rather than a lack of knowledge. Part (b) was less accessible to candidates than part (a), with a range of incorrect symbols being chosen, seemingly randomly.

Question 6

Part (a) was generally answered well, with a good number of fully correct responses. There were a number of candidates who chose to give the upper end of the inequality first, resulting in an answer of $1 \geq x > -2$, this was awarded full marks. The challenge seen in a handful of responses was deciding which of the inequality signs should include the "or equal to", answers such as $-2 \leq x < 1$ or $-2 < x \geq 1$ were often seen and awarded one mark. The weaker responses gave answers with no variable, such as $-2 \leq 1$, or listed the integer values that satisfied the inequality, these gained no credit.

Part (b) was answered with a good degree of success, very few responses gained no credit. Candidates seemed to follow the given direction to show clear algebraic working. Manipulating the inequality to isolate the *a* terms on one side and the number terms on the other was confidently carried out, at this stage the mark could be awarded for any sign in between the two sides. A minority of candidates stopped here and gave their final answer as $4a \leq 33$, others went on to present the correct answer in their working but then dropped or replaced the inequality sign in their final answer. These responses were only awarded the method mark.

Question 7

This question, although positioned relatively early in the paper, presented a significant challenge. Having said that the question did discriminate well and the range of available marks were awarded. The addition of a variable into the given speed was seemingly ignored by a number of candidates and answers of 180, which showed an understanding of how to convert from metres per second to kilometres per hour were awarded two marks. Responses that omitted the x were often limited to one mark due to errors in the method to convert. There were a number of ways that candidates could be awarded the first mark and these were all seen and awarded. This included dividing by 1000 or multiplying by 3600 or as was commonly seen using both the conversion factors incorrectly, effectively multiplying rather than dividing by $\frac{1000}{3600}$, this was often seen in stages and still gained the credit. In weaker responses it was a shame to see it stated or used that 100 m = 1 km.

Question 8

This standard algebra question, assessing laws of indices and factorising and solving a quadratic equation was competently answered. Parts (a) and (b) had very few incorrect responses and sight of a^{60} or $c^{2.5}$ was pleasingly rare. In a few cases the final answer was just given as 16 or 18, respectively, on the answer line. This could not be awarded the marks as the command was to simplify. In part (c) (i) the majority of candidates could correctly factorise and then follow this up with the correct answer in part (ii). Errors in the factorising were usually limited to a sign error in one or both of the factors. It was noticeable, that even amongst candidates who were successful that they did not make the immediate connection between the two subparts and the meaning of the word "hence". There were a number of responses where the candidate seemingly started again or used unnecessary strategies such as using the quadratic formula or completing the square. Provided a correct factorisation was seen then this was viewed as a check of their solutions and the mark for correct solutions was awarded. If the correct factorisation was not seen and correct solutions came from one of these approaches, then no mark could be awarded for solving. Although the question was a quadratic in terms of y, a significant number of candidates gave their answers to one or both parts in terms of x. This was condoned but may indicate relying on rote processes rather than full understanding.

Question 9

Applying trigonometry to find the missing side of a right-angled triangle seemed to be a topic that candidates were familiar and comfortable with answering. Candidates who recognised that they needed to use the tangent ratio generally started by writing an equation in the form $\tan 24 = \frac{6.5}{QR}$, gaining the first mark. Most then progressed to the correct answer, however a small number of candidates found the rearrangement problematic and wrote $QR = 6.5 \tan 24$ instead. Additionally, there were a few candidates who correctly wrote that QR

was equal to $\frac{6.5}{\tan 24}$ but then were unable to get an accurate answer from their calculator. A number of responses opted to use the Sine rule, or the sine ratio to find *PR* and then Pythagoras' theorem to find *QR* and these were also overwhelmingly successful. With all approaches there was evidence of some candidates rounding prematurely and using the rounded values to calculate with, leading to a final answer outside of the required range. It is important that centres instil in candidates the need to calculate with full values and round only at the end of the question.

Question 10

Good solutions to this problem solving question involving volumes were seen with clear steps of working shown and correct values given in order to satisfy the show that condition. Calculating the volume of the cuboid or the volume of the water along with the volume of the cylinder was a common way of gaining the first two method marks. This however was not sufficient to show that the cuboid would not be full of water and meant some responses were limited to two marks. Many candidates who found the volume of the space in the cuboid and the volume of the cylinder, already gaining full marks, made the additional step of calculating the amount of space that would be left. There were a small number of responses that took an alternative approach of calculating the height the water would reach when poured into the cuboid and making a comparison to the height of the cuboid, such responses were awarded accordingly and generally gained full marks.

Question 11

Whilst generally familiar with compound interest there were some elements of this problem solving question based on investing a sum of money and comparing the interest received that challenged candidates. It was pleasing though that this question did allow most candidates to gain some partial credit for their knowledge and understanding. Many were able to gain two or three marks for demonstrating a good understanding of compound interest and calculating either the final value of the investment or the total value of the interest for Bank B. Working with the ratio for Bank A was less successful and there was a common error of dividing the investment into 23 parts rather than the 20 parts assigned to the investment. Some candidates found the final value of the investment for both banks and then subtracted these values. This of course was not a correct approach due to the different amount initially invested in each bank. Weaker responses often gained a mark under the special case for finding 4% or 8% of the investment. Centres need to consider that writing 3000 × 4% does not constitute a correct method if the correct value is not found.

Question 12

Candidates found this cumulative frequency question accessible and most gained some credit for demonstrating understanding of the topic. Part (a) was answered extremely well with very few minor mistakes seen. Part (b) was also generally well completed, although there were some responses where the points were not plotted at the end of the intervals so could not gain full credit. There were still a number of candidates who attempted to draw histograms which gained no marks. Part (c)inevitably had more varied responses and degrees of success. Common errors included candidates reading incorrect values from their graphs or failing to subtract their reading from the total frequency of 80, therefore calculating the percentage of people who were under 46 years of age rather than over. It should be highlighted to candidates the importance of showing how they obtain their readings from graphs by drawing on clear lines up to the curve and across to the y-axis. In part (c) follow through marks from an incorrect graph were available provided that a clear method was shown, some candidates missed out on these marks due to insufficient working shown. A very small minority attempted a process of interpolation from the table and whilst the question had asked them to use their graph this was given full credit provided it gave an answer in the required range.

Question 13

Those candidates who were familiar with the term interquartile range generally gained both marks for a correct answer. There was some confusion over how to identify the quartiles for a discrete set of data with attempts made to divide 11 by 4 and then use this to state the lower quartile as halfway between the second and third values in the list. Another incorrect identification of quartiles that was seen was to calculate 19.5 – 13.5. For one mark the values needed to be unambiguously identified, in some responses the lower quartile, median and upper quartile were all just circled with no indication which values represented the upper and lower quartiles. Such responses gained no credit. Where it was clear that the term interquartile range was not familiar answers of 18, which was the median, the range or the mean were typically seen.

Question 14

Whilst standard form is usually a confident topic for candidates this question provided a greater challenge due to the magnitude of the powers meaning that the values could not be input into a calculator. Candidates either gained full marks or no marks with very few responses gaining just one mark. A mark was available for rewriting one of the values so that the indices in both numbers were the same, candidates who did this tended to progress to a correct final answer.

The most common error was not considering the relative place value of the 6.7 and the 3 and adding these to gain a value of 9.7 compounding this with a confusion of how to deal with the indices, invariably adding these as though it was a multiplication question. This resulted in an answer of 9.7×10^{269} which was incorrect.

Question 15

Part (a) of this question was a good test of candidates' algebraic manipulation skills, and many gained full marks for a correct answer with clear algebraic working. The main difficulty in this question was dealing correctly with the subtraction and not applying this to both terms in the numerator of the second fraction. This resulted in a numerator of $20a + 32 - 6a + 15$, as one error was allowable in awarding the method marks these responses often still did gain three marks for correctly isolating the terms in an equation. Relatively commonly seen incorrect equations were either $14a + 47 = 276$ or $14a - 17 = 276$, these were indicative of a correct method with one error and were awarded the first two method marks. Weaker responses failed to clear the fraction, this limited the response to a maximum of one mark. Correct answers with no supportive working scored no marks due to the instruction to show clear algebraic working.

Part (b) was attempted by most candidates and discriminated well. Many candidates were able to give a correct first step but struggled to convert to the format required in the question. An understanding of the reciprocal rule was shown more often than the numerical power used for a root. The most commonly seen answer for the method mark was $\frac{3}{\sqrt{y}}$, at this stage many candidates attempted to rationalise the denominator $\frac{3}{\sqrt{y}} \times \frac{\sqrt{y}}{\sqrt{y}} = \frac{3\sqrt{y}}{y}$ and were unable to reach a power of. $-\frac{1}{2}$ Those candidates that understand the square root could be shown with a power of $\frac{1}{2}$ rarely reached beyond the stage of $\left(\frac{y^{0.5}}{3}\right)^{-1}$ or $\frac{3}{y^{0.5}}$ or proceeded to $3y^{0.5}$.

Question 16

This familiar style of question requiring a recurring decimal to be converted to a fraction saw a good number of fully correct solutions with all required steps of working shown. Candidates generally knew to multiply the decimal value by powers of 10, however recurring notation was not always shown, as long as at least 5 significant figures were seen on one of the numbers used the marks could be awarded. Where the accuracy mark was not awarded this was either because the candidate jumped from *990x* = 606 to $x = \frac{101}{165}$ without first showing $x = \frac{606}{990}$ or they did not use any algebra in their working. In weaker responses the numbers chosen for subtraction did not result in an integer value or terminating decimal so no marks could be awarded.

Question 17

This algebraic proof question proved to be a question that many candidates struggled to access. Those responses that gave correct terms for the three consecutive values often went on to achieve full marks. There were fundamental errors seen in the algebraic manipulation, particularly when squaring terms. Missing brackets were not condoned, writing $4n^2$ instead of $(4n)^2$ or $4(n + 2)^2$ instead of $(4(n + 2))^2$ limited responses to one mark. Many candidates did seem to know that an algebraic approach was needed but gave the terms as n, $n + 1$, $n + 2$ or $4n$, $8n$, $12n$ rather than consecutive multiples of 4, even if they went on to square the first and third term and find the difference no marks could be awarded. Attempting to prove by using numerical examples was commonly seen in the weakest responses, demonstrating a limited understanding of an algebraic proof which required "clear algebraic working".

Question 18

A good number of fully correct responses to this inverse proportion question were seen and many candidates were familiar with the structure of the two parts in the question. One of the main reasons that marks were not awarded in part (a) was due to either misreading or misinterpreting the question. This was either using direct proportion with $F = kr^3$ or inverse proportion with r or r^2. Some responses fell short of gaining all three marks in part (a) as they gave the final answer as 48 rather than as a formula or they found the value of k = 48 but wrote an incorrect formula on the answer line such as $F = \frac{48}{r^2}$. The use of the proportionality symbol in place of an equals sign can be condoned for the method marks in this question but not the accuracy mark. In some cases the answer to part (a) was given as $F = \frac{k}{r^3}$ and then the working to find the value of k was seen in the solution to part (b), this could not be credited for part (a) and is something for centres to be aware of. In part (b) those candidates who had a correct answer in part (a) generally progressed to a correct answer in part (b). Errors in the manipulation of the formula were seen, for example $r^3 = \frac{3072}{48}$ which gained no marks. There were also errors seen when taking the cube root of the value, either calculating the square root or 3 times the square root as opposed to the cube root or giving a solution of $\pm\frac{1}{4}$.

Question 19

This question was designed to test conditional probability in a problem solving context, it proved to be a challenging question for the majority of candidates. There were however some very efficient correct solutions seen that used combinations or a sample space diagram to extract the required probability from, bypassing the need to find products. If a sample space diagram was seen on its own and no attempt was made to extract probabilities this was insufficient for any marks. A good number of candidates were able to score the first mark for finding one correct product which showed an understanding of the non-replacement nature of the problem. Many responses were incomplete as they did not successfully consider all of the required combinations that would result in a sum less than 5, in particular where there was more than one counter of the same value. If replacement was used this could only result in a maximum of one mark if this was used to obtain a full solution to the problem.

Question 20

The use of Pythagoras' Theorem in 3 dimensions was carried out successfully by a good number of candidates. Applying Pythagoras' Theorem twice was the most efficient way to answer this question, there were however more circuitous routes seen using trigonometry as well, these were awarded marks accordingly. In a very few cases the final answer was left as $\sqrt{194}$ which can only be awarded the two method marks. There were a number of responses that carried out a correct first step, for example finding the length of *AC*, but stopped here believing that this was the final answer for *BC*. In weaker responses there was evidence of some confusion of which side was the hypotenuse in the right-angled triangle they were using and Pythagoras' Theorem was then incorrectly applied.

Question 21

Part (a) of this graph transformation question saw a good number of correct answers for the difficulty of the question. Answers that were incorrect either knew that only the *x* coordinate would be affected but worked as though it was the transformation of $y = 3\mathrm{f}(x)$ and gave the answer (−18, 9) or they knew to enlarge by a scale factor of $\frac{1}{3}$ but applied this to both coordinates and gave an answer of (−2, 3). A final answer of (−18, 27) was not uncommon, essentially showing two misconceptions. Part (b) which involved two translations provided more of a challenge for candidates. Those who achieved both marks often showed very little or no working out which was acceptable as working was not required. Some responses gained one mark by looking at the difference between the two coordinates and giving one correct value for either *a* or *b*. The responses that gained no marks were usually for attempts at trying to find the gradient between the two points or substituting both coordinates into the given equation in an attempt to find two equations to solve.

Question 22

A good number of candidates were able to solve the linear and quadratic simultaneous equations confidently and gain full marks. The preferred approach was to replace *y* in terms of *x* which resulted in easier manipulation and was more likely to progress to gain full or part marks. Errors in the algebraic manipulation were not commonly seen but tended to occur when expanding the brackets and collecting the terms to form a three term quadratic. If an incorrect quadratic was seen then a mark for a correct method to solve was available. It should be noted that if the quadratic equation is incorrect that correct solutions arrived at with no method, just from using the calculator to solve, cannot be awarded the method mark. In some responses the final step of substituting their found values of *x* into one of the given equations led to incorrect final answers due to substituting into the given quadratic equation and not realising that they needed the negative solution rather than the positive one. It would be advisable to encourage candidates to substitute back into the given linear equation.

Question 23

This intersecting chords theorem was challenging for a good number of candidates who seemed unfamiliar with the topic. There were some very pleasing attempts which resulted in a correct answer, in a few cases the correct answer was seen but was followed by an incorrect simplification to $\frac{23x}{11x}-3$, this could not be ignored for the awarding of the accuracy mark.

In weaker responses there was evident confusion from the start with attempts to add the chord lengths or confuse the internal chords property with the external chords property. If the candidate did make an incorrect start by stating that $4x(y+3)=(x+2)(3y-5)$ this could be followed through for awarding the method marks as it had the equivalent demand for algebraic manipulation as the correct equation. There were errors seen in expanding the brackets, if the error was only in one term then marks could be awarded for the subsequent isolating and factorising and these were frequently awarded.

Question 24

As expected at this stage of the paper there were a number of blank responses and poorly organised attempts at working with the formulae for an arithmetic series. However, the higher attaining candidates did produce some well-structured and organised responses to this multi-step algebraic question. The key to this question was realising that two equations were needed, one from using the differences and one from using the sum of the terms. These equations could either be in terms of *x* and *y* or in terms of *x* and *d*. They then needed to be solved simultaneously. At this grade there is a greater expectation for correct algebra and unfortunately some candidates lost marks due to missing brackets when finding the difference between the terms, for example writing $3y-4-2x+5$ and not recovering this in the subsequent working. There were some misconceptions over the variable *d* with a common mistake being to equate the difference between the 2nd and 1st term with the difference between the 3rd and 2nd term resulting in $6x-6y+11=0$ and using this in place of *d* in the sum of the terms formula. This did however gain two marks for a correct equation in terms of *x* and *y*. Solving the two equations by substitution rather than elimination was the preferred approach, there were however algebraic and arithmetic errors often seen in the manipulation which led to inaccuracies and loss of marks.

Question 25

The penultimate question on the paper provided a challenge, even for the higher attaining candidates on this paper. There were some candidates who started correctly by setting up an equation using the area of the sector subtract the area of the triangle gaining the first mark but were unable to correctly rearrange to find the value for the radius. Setting the area of the sector equal to 28 was a common incorrect start. If candidates did give a clearly identified value for the radius that was incorrect they were able to gain credit later in the question and many candidates did just this, often being awarded three or four of the available method marks. There were noticeable errors made with mis-assigning lengths or confusing the arc length with a linear length. For example, the value of the radius was often used in place of *BC* to attempt to calculate the arc length *BD* or instead of calculating the arc length *BD* the cosine rule was used to calculate the length *BD*. Those who did use their radius correctly to find the length of *BC* did equally successfully using the cosine rule or sine rule. Alternative attempts were seen using right angled trigonometry to find the radius or to go to directly to the length *BC*, bypassing the need to find the radius, all such responses were awarded with appropriate credit. Additionally, some more able candidates used the arc length and sector area formulae and worked in radians, this was perfectly acceptable. However, in a good number of these attempts the angle used was still in degrees which limited the number of marks that could be awarded.

Question 26

As expected the final question on the paper did challenge all but the highest performers. From these candidates there were some very succinct and efficient correct responses. There were however, a number of attempts that lacked any logical structure with numbers scattered around the page with numerous flawed attempts made. The first step to this problem effectively relied on the candidate realising that they needed to use the value 1.728 and cube root this. Attempts at using 0.728 or 72.8% could gain no credit. Those who did find a scale factor of 1.2 then seemed unsure of how to progress, often getting confused as to which of the solids this applied to. The second mark needed a link between **S** and **T,** just finding the area scale factor between **R** and **S** was not sufficient but was commonly seen. Some candidates did find the linear scale factor between **S** and **T** as 5 but had lost track of what this represented and stopped here. A very few good responses fell short of being awarded the final A mark as they found *k* to be 25 but then gave an answer of 5 or $\frac{1}{25}$ which showed a lack of understanding of what their values represented.

Based on the performance on this paper, candidates should

- Practice calculating with numbers in standard form without a calculator
- Be encouraged to maintain greater accuracy by not rounding values part way through a question
- Show all steps of working in a "show that" question, in particular for fractions and recurring decimals
- Familiarise themselves with formal set notation
- Use brackets correctly and consistently within algebraic expressions
- Practise formal algebraic proof questions, focussing on expressing the initial terms correctly to satisfy the conditions

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